Comparison of Acid-Washed and Cleaved Pyrite

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Introduction: The method by which important minerals are prepared can affect the materials physical and chemical properties. Surfaces of pyrite, FeS_2, are often prepared by either cleavage or by acid-washing the "as-grown" surface. This photoemission study investigates the pyrite surface that is created by both these preparation methods.

Methods and Materials: {100} pyrite surfaces were prepared by cleavage (mechanical fracture) or by washing an "as-grown" surface with HCl solution. Photoelectron spectroscopy of the S 2p core level was used to investigate the surfaces.

Results: **Figure 1** exhibits S 2p data for acid-washed and cleaved {100} pyrite. The features at 161.2, 162.1 are tentatively assigned to S^{2-} impurity and surface S_2^{2-} (characteristic group of pyrite). The 162.7 eV feature is assigned to near surface S_2^{2-}. The acid-washed pyrite sample has additional spectral weight to high binding energy (enclosed by circle). This spectral weight is associated with surface polysulfide formed by the acid-washing treatment.

Conclusions: Future experiments will investigate the surface reactivity of these two surfaces. Specifically, does the polysulfide component on the acid-washed sample alter the reactivity of the surface, when compared to the cleaved sample.

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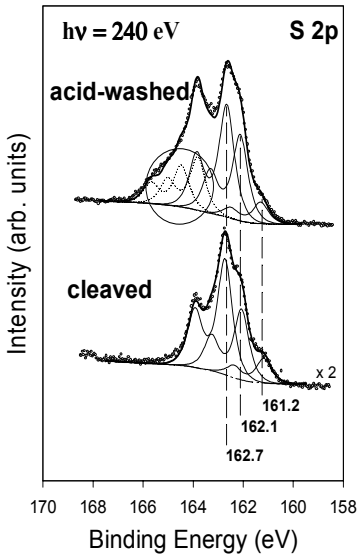

Figure 1. S 2p data for {100} pyrite prepared in two different ways. The sample prepared by acid-washing an "as-grown" surface exhibits polysulfide impurity (spectral weight enclosed by circle).